FIELD0

X — a
b   0   1

0

1

28

30

24A

38

36B

36A

34

24B

FIELD1

ef   cd
     00   01   11   10

00

01

11

10

44A

49

48A

45

FIELD2

i   gh
    00   01   11   10

0

1

i   gh
    00   01   11   10

0

1

48B

i   gh
    00   01   11   10

0

1

24C

20

22A   22B   22C

23

50

$x = a'b \{ c'd'efghi + c'd'ef \, [g'h'i + ghi] + c'def \, [g'h'i + ghi] \}$

$x = f(a, b, c, d, e, f, g, h, i)$

FIG. 1

INPUT A TRANSFORM RELATING
A BINARY VARIABLE TO A SET
OF BINARY INPUT VARIABLES
— 101

SEPARATE INPUT VARIABLES
INTO SUCCESSIVE FIELDS
— 102

DEFINE A FIRST FIELD
COMBINATION MAP HAVING CELLS
EACH REPRESENTATIVE OF A
DIFFERENT BINARY COMBINATION
OF THE FIRST FIELD VARIABLES
— 104

ASSIGN A DIFFERENT SUCCESSIVE
FIELD COMBINATION MAP TO
EACH PRECEDING FIELD CELL
— 112

DEFINE A SUCCESSIVE FIELD
COMBINATION MAP HAVING CELLS
EACH REPRESENTATIVE OF A
DIFFERENT BINARY COMBINATION
OF THE SUCCESSIVE FIELD
VARIABLES
— 110

IS
THIS
THE LAST
FIELD
?
— 108

N
— 106

Y

ASSIGN, IN ACCORDANCE WITH THE
TRANSFORM, A BINARY VALUE TO
EACH FIELD CELL CHAIN FORMED
BY A LAST FIELD CELL AND THE
PRECEDING FIELD CELLS LINKED
THERETO BY SUCCESSIVE
FIELD ASSIGNMENTS
— 114

100

FIG. 2

130

132 — DISPLAY FIRST FIELD COMBINATION MAP AS A CELL ARRAY IN A SIMULATED THREE DIMENSIONAL PLANE

134 — DISPLAY ALL SUCCESSIVE FIELD COMBINATION MAPS AS CELL ARRAYS ORGANIZED IN A SIMULATED THREE DIMENSIONAL PLANE SPACED BEHIND THE PRECEDING MAP PLANE

136 — CONNECT EACH SUCCESSIVE FIELD MAP TO ITS PRECEDING FIELD CELL WITH AN ARROW

138 — DISPLAY EACH FIELD CELL CHAIN BINARY VALUE IN ITS ASSOCIATED LAST FIELD CELL

FIG. 3B

120

123 — CREATE A SUCCESSIVE FIELD COMBINATION MAP FOR EACH PRECEDING FIELD CELL

124 — ASSIGN A UNIQUE IDENTIFIER TO EACH PRECEDING FIELD CELL

126 — ASSICIATE EACH SUCCESSIVE FIELD COMBINATION MAP WITH A DIFFERENT IDENTIFIER

FIG. 3A

FIG. 4A

| | 0 READY | 1 AIMED | 3 FIRE | 2 INVALID |
|---|---|---|---|---|
| READY (self) | 5 | | | |
| READY → INVALID | 3 | | | |
| READY → AIMED | 1 | | | |
| AIMED (self) | | 7 | | |
| AIMED → FIRE | | 2 | | |
| AIMED → INVALID | | 4 | | |
| FIRE (self) | | | 8 | |
| FIRE → INVALID | | | 5 | |

**FIG. 4B**

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| yz \ wx | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 | 0 | 1 | 0 |
| 01 | 2 | 2 | 2 | 2 |
| 11 | 2 | 2 | 2 | 2 |
| 10 | 2 | 2 | 2 | 2 |

168

| yz \ wx | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 2 | 2 | 2 | 2 |
| 01 | 2 | 2 | 2 | 2 |
| 11 | 2 | 2 | 2 | 2 |
| 10 | 2 | 2 | 2 | 2 |

166 / 170

| yz \ wx | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 2 | 2 | 1 | 2 |
| 01 | 2 | 2 | 2 | 2 |
| 11 | 2 | 2 | 3 | 2 |
| 10 | 2 | 2 | 1 | 2 |

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| yz \ wx | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 2 | 2 | 2 | 2 |
| 01 | 2 | 2 | 2 | 2 |
| 11 | 2 | 2 | 3 | 2 |
| 10 | 2 | 2 | 2 | 2 |

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| B \ A | 0 | 1 |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 2 | 3 |

**FIG. 4B**

138

w = FUEL
x = COMPTR
y = AIMED
z = BUTTON

**FIG. 4C**

FIG. 5

188B

188

184

189

180   186   190

A+ = f(A,B,w,x,y,z) 182

192

A+ = A'B'wxy'z' + AB'(wxz' + wxyz) + ABwxyz

# FIG. 6A

800

PRINTER — 804

PRINTER INTERFACE — 806

KEYBOARD — 820

KEYBOARD INTERFACE — 826

POINTING DEVICE — 822

POINTING DEVICE I/F — 828

HARD DISK DRIVE — 814

DISK CONTROLLER — 816

FLOPPY DISK DRIVE — 812

BUS — 802

MONITOR — 818

VIDEO INTERFACE — 824

MICRO-PROCESSOR — 808

RAM MEMORY — 810

POWER SUPPLY — 830

FROM AC POWER SOURCE

FIG. 6B

OPERATING SYSTEM `832`

STATE TRANSITION TIME ESTIMATION PROGRAM `838`

DEAD & HANGING STATE TESTING PROGRAM `842`

APPLICATION PROGRAM `834`

LOGIC SIMPLIFYING PROGRAM `840`

DEBUGGING PROGRAM `836`

START

SELECT THE FIELD WHICH IS ABOVE THE FIELD WHOSE INPUTS ARE TO BE IDENTIFIED AS ACTIVE OR INACTIVE — 230

SELECT THE DESIRED STATE OR FIELD COMBINATION WHICH WILL HAVE ITS NEXT LOWER LEVEL INPUTS MARKED AS ACTIVE OR INACTIVE — 231

MARK THOSE INPUTS SELECTED TO BE DISPLAYED IN THE FIELD BELOW THIS FIELD COMBINATION AS ACTIVE INPUTS FOR THIS COMBINATION, AND MARK ALL OTHER INPUTS AS INACTIVE — 232

GENERATE AN ARRAY OF INPUTS INDICATING ACTIVE OR INACTIVE INPUTS FOR THIS COMBINATION — 233

ARRANGE THE ACTIVE INPUTS INTO A CONTINUOUS SEQUENCE OF INPUTS SUCH THAT THE INPUTS WILL BE DISPLAYED IN ORDER AT THE NEXT LOWER FIELD LEVEL — 234

GO DOWN TO NEXT LEVEL OF SELECTED COMBINATION? — 235

N

STOP

Y

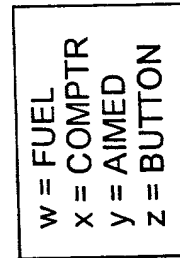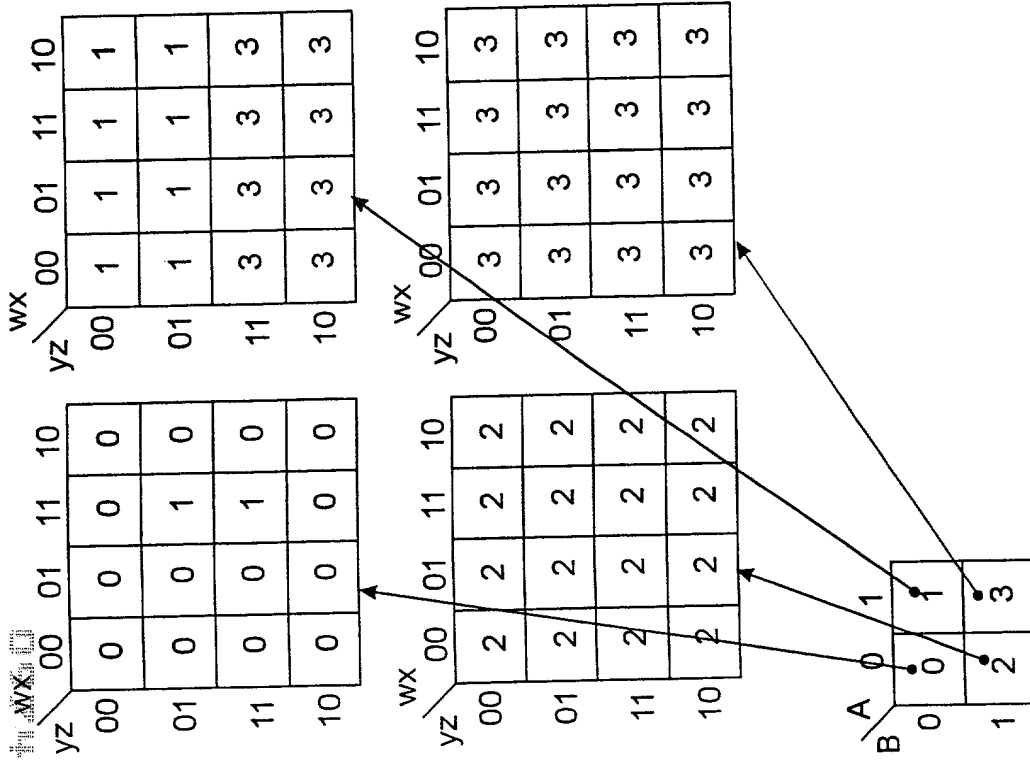DISPLAY THE COMBINATION OF THE ACTIVE INPUTS WITH ASSIGNED BIT LOCATIONS FOR THE CONTINUOUS SEQUENCE FOR THIS FIELD — 236
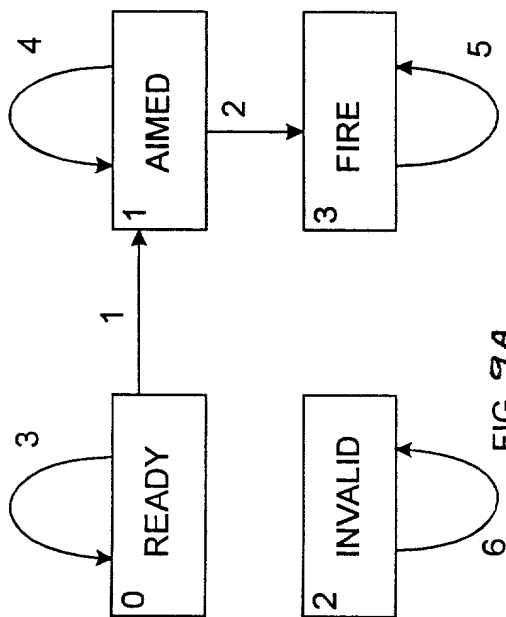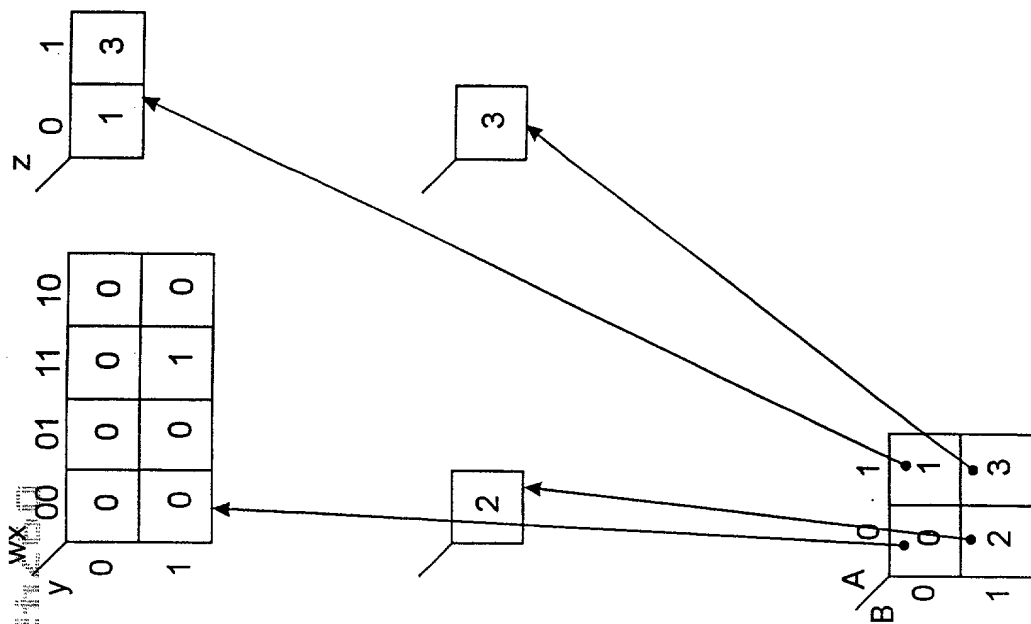
FIG. 7

229

FIG. 8B

w = FUEL
x = COMPTR
y = AIMED
z = BUTTON

FIG.8C

FIG. 8A

**FIG. 9B**

**FIG. 9A**

**FIG. 9C**

w = FUEL
x = COMPTR
y = AIMED
z = BUTTON

START

301 GET THE NUMBER OF EQUATIONS AND THE NUMBER OF OUTPUT STORAGE UNITS

302 ARE THERE ANY MORE EQUATIONS?

318 N STOP

303 Y GET THE OUTPUT BIT, SET/RESET AND THE NUMBER OF MINTERMS FOR THIS EQUATION AND MARK EQUATION AS FALSE

304 ARE THERE ANY MORE MINTERMS?

Y (A)

N

314 IS OUTPUT ASSERTED?

Y

N

315 IS OUTPUT BIT TO BE SET?

Y

N

316 SET OUTPUT BIT

317 RESET OUTPUT BIT

(A)

300

GET THE NUMBER OF VARIABLES IN THIS MINTERM AND MARK MINTERM AS TRUE

306 ARE THERE ANY MORE VARIABLE IDENTIFIERS?

307 Y GET THE NEXT VARIABLE IDENTIFIER

308 IS THIS VARIABLE IDENTIFIER NOTED?

Y

N

309 IS CORRESPONDING INPUT NOT NOTED?

N

Y

311 IS CORRESPONDING INPUT NOTED?

Y

N

310 MARK THIS MINTERM AS FALSE

312 N IS MINTERM TRUE?

Y

313 MARK EQUATION AS TRUE

FIG. 10

| Ref | Value | Description |
|---|---|---|
| 400 | 2 = 2#0000_0000_0000_0010# | NUMBER OF EQUATIONS |
| 401 | 17 = 2# 0000_0000_0001_0001# | LOCATION OF END OF ARRAY |
| 402 | 16384 = 2#1000_0000_0000_0000# | BIT LOCATION OF EQUATION 1.  EQUATION WILL BE SET |
| 403 | 2 = 2#0000_0000_0000_0010# | NUMBER OF MINTERMS OF EQUATION 1 |
| 404 | 3 = 2#0000_0000_0000_0011# | NUMBER OF VARIABLES IN MINTERM 1 OF EQUATION 1 |
| 405 | 16384 = 2#1000_0000_0000_0000# | FIRST VARIABLE IDENTIFIER OF MINTERM 1 OF EQUATION 1, NOTED |
| 406 | 1 = 2#0000_0000_0000_0001# | SECOND VARIABLE IDENTIFIER OF MINTERM 1 OF EQUATION 1 |
| 407 | 16386 = 2#1000_0000_0000_0010# | THIRD VARIABLE IDENTIFIER OF MINTERM 1 OF EQUATION 1 |
| 408 | 3 = 2#0000_0000_0000_0011# | NUMBER OF VARIABLES IN MINTERM 1 OF EQUATION 1, NOTED |
| 409 | 1 = 2#0000_0000_0000_0001# | NUMBER OF VARIABLES IN MINTERM 2 OF EQUATION 1 |
| 410 | 1 = 2#0000_0000_0000_00001# | FIRST VARIABLE IDENTIFIER OF MINTERM 2 OF EQUATION 1 |
| 411 | 1 = 2#0000_0000_0000_0001# | NUMBER OF VARIABLES IN MINTERM 2 OF EQUATION 1 |
| 412 | 3 = 2#0000_0000_0000_0010# | BIT LOCATION OF EQUATION 2,  WILL BE RESET |
| 413 | 1 = 2#0000_0000_0000_0001# | NUMBER OF MINTERMS OF EQUATION 2 |
| 414 | 1 = 2#0000_0000_0000_0001# | FIRST VARIABLE IDENTIFIER OF MINTERM 1 OF EQUATION 2 |
| 415 | 1 = 2#0000_0000_0000_0001# | NUMBER OF VARIABLES IN MINTERM 1 OF EQUATION 2 |
| 416 | 0 = 2#0000_0000_0000_0000# | END OF ARRAY |

417 —— BIT0 (TO BE SET) := NOT VARIABLE_0 AND VARIABLE_1 AND NOT VARIABLE_2 OR NOT VARIABLE_1

418 —— BIT3 (TO BE RESET) := NOT VARIABLE_1

FIG. 11

a_next:= {(a,b,c,d,e,f,g,h,i}

b_next = f{a,b,c,d,e,f,g,h,i}

x = f{a,b,c,d,e,f,g,h,i}

505 a_next

506 b_next

507 x

504

508

STATE STORAGE

TRANSFORM

a
b

c
d
e
f

g
h
i

501 FIELD0

502 FIELD1

503 FIELD2

FIG. 12

FIELD2

FIELD1

FIELD0

601

602

603

604

605 $x = f\{a, b, c, d, e, f, g, h, i\}$

$x = f\{a, b, g, h, i\}$  where $a = 0, b = 1$

606 $x = a'b \{ g'h'i + ghi \}$

FIG. 13

LOWEST LEVEL FIELD

NEXT STATE FIELD

S = SPECIFIED
U = UNSPECIFIED
O = OVERLAP OF SPECIFICATIONS

THE NEXT STATE SPECIFICATIONS THAT ARE BELOW STATE FIELD COMBINATION 3, NAMELY,
"FOR ALL COMBINATIONS WHERE AByz' ARE TRUE GO TO NEXT STATE 1, AND
FOR ALL COMBINATIONS WHERE ABwx ARE TRUE GO TO NEXT STATE 2,"
WILL RESULT IN AN OVERLAPPED (O) OR AMBIGUOUS SPECIFICATION FOR COMBINATION ABwxyz'
AND UNSPECIFIED (U) OR INCOMPLETE SPECIFICATION IN COMBINATIONS AB(w'y'+w'z+x'y'+x'z ).
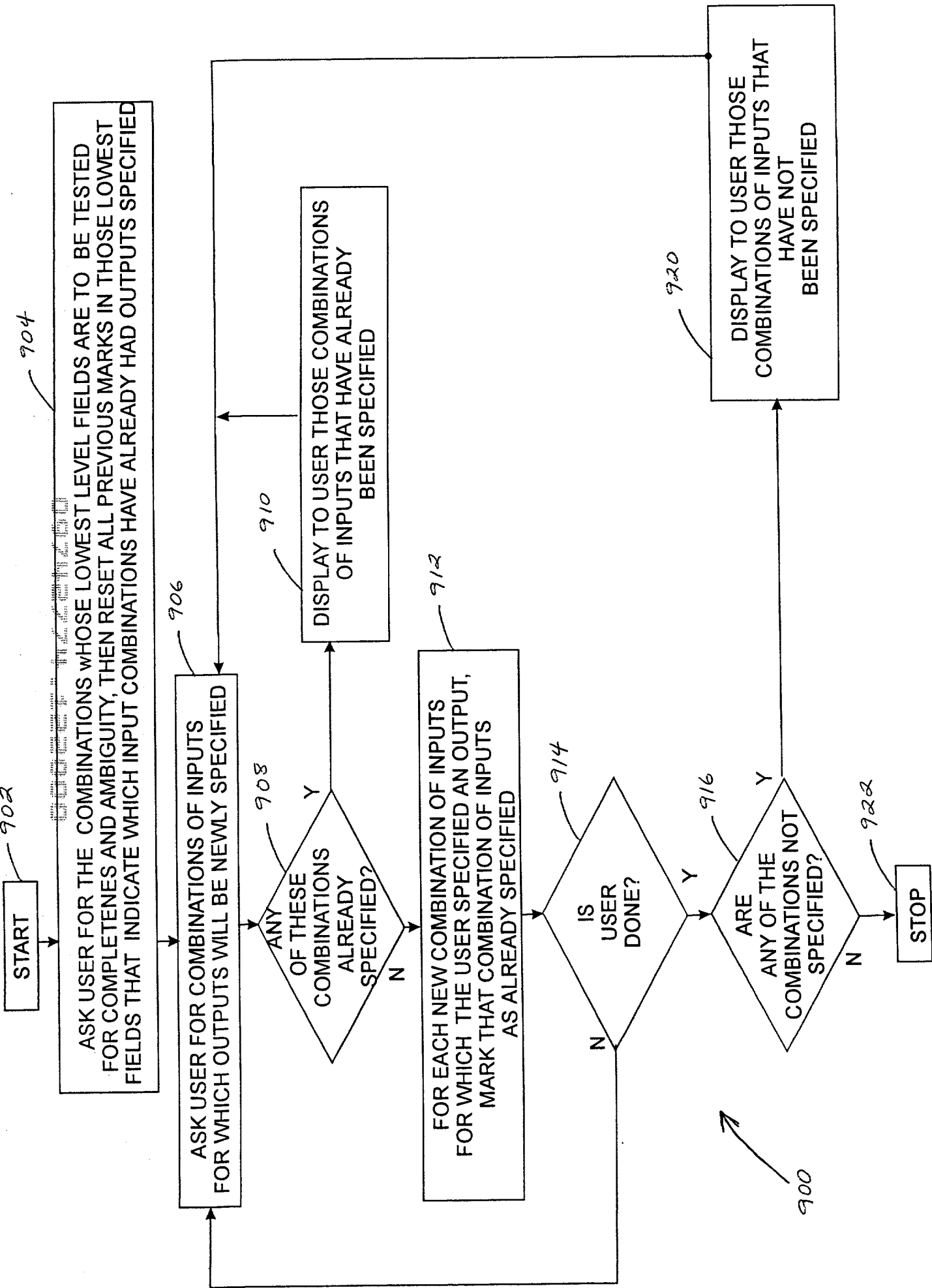
FIG. 14

START 902

ASK USER FOR THE COMBINATIONS WHOSE LOWEST LEVEL FIELDS ARE TO BE TESTED FOR COMPLETENES AND AMBIGUITY, THEN RESET ALL PREVIOUS MARKS IN THOSE LOWEST FIELDS THAT INDICATE WHICH INPUT COMBINATIONS HAVE ALREADY HAD OUTPUTS SPECIFIED 904

ASK USER FOR COMBINATIONS OF INPUTS FOR WHICH OUTPUTS WILL BE NEWLY SPECIFIED 906

ANY OF THESE COMBINATIONS ALREADY SPECIFIED? 908

Y

DISPLAY TO USER THOSE COMBINATIONS OF INPUTS THAT HAVE ALREADY BEEN SPECIFIED 910

N

FOR EACH NEW COMBINATION OF INPUTS FOR WHICH THE USER SPECIFIED AN OUTPUT, MARK THAT COMBINATION OF INPUTS AS ALREADY SPECIFIED 912

IS USER DONE? 914

N

Y

ARE ANY OF THE COMBINATIONS NOT SPECIFIED? 916

Y

DISPLAY TO USER THOSE COMBINATIONS OF INPUTS THAT HAVE NOT BEEN SPECIFIED 920

N

STOP 922

900

FIG. 15